

Amendments to the Claims

The current listing of the Claims replaces all previous amendments and listings of the Claims.

1. (Currently Amended) A multi-beam scanning device comprising:

a subassembly comprising

a holder comprising a mounting portion, an engaging section, and a projection,

a laser diode array disposed on the mounting portion of the holder and having at least three light emitting points arranged in a package at an equal interval and configured to emit respective laser beams that form corresponding laser beam spots on a recording medium at a minimum recording interval, ~~the laser diode array disposed on a holder having a projection configured to receive a collimator thereon,~~

a collimator lens disposed on the projection, and

an aperture disposed on the projection to cover the collimator, and

a bracket defining an engaging hole, the engaging hole of the bracket surrounding and contacting the engaging section of the holder,

wherein

the holder and the bracket define voids configured to permit connection of the holder and the bracket at a plurality of relative dispositions,

the laser beams from the at least three light emitting points scan the recording medium in a main scanning direction while being at least one of on and off so as to form a light image having the minimum recording interval in the recording medium,

the equal interval is not greater than the minimum recording interval,

the at least three light emitting points are arranged such that the corresponding laser beams spots on the recording medium are arranged substantially in a line in a direction orthogonal to the main scanning direction, and

any one of the laser beams is used as a clock laser beam configured to determine a timing of starting each main scanning.

2. (Canceled)

3. (Previously Presented) The multi-beam scanning device according to Claim 1, further comprising:

an abnormal lighting detector configured to detect abnormal lighting of the one of the at least three light emitting points configured to emit the clock laser beam; and

a laser beam changer configured to change the clock laser beam to any one of the laser beams emitted by the other light emitting points normally emitting a laser beam, when the abnormal lighting detector detects abnormal lighting.

4. (Original) The multi-beam scanning device according to Claim 1, wherein a variation in position of the at least three laser beam spots configured to be arranged substantially in a line is not greater than $21.17\text{ }\mu\text{m}$.

5. (Original) The multi-beam scanning device according to Claim 1, wherein the equal interval is not greater than $14\text{ }\mu\text{m}$.

6. (Currently Amended) An image forming apparatus comprising:

a recording medium; ~~and,~~

a subassembly comprising

a holder comprising a mounting portion, an engaging section, and a projection,

a laser diode array disposed on the mounting portion of the holder and having at least three light emitting points arranged in a package at an equal interval and configured to emit respective laser beams that form corresponding laser beam spots on the recording medium at a minimum recording interval, ~~the laser diode array disposed on a holder having a projection configured to receive a collimator thereon,~~

a collimator lens disposed on the projection, and

an aperture disposed on the projection to cover the collimator, and
a bracket defining an engaging hole, the engaging hole of the bracket surrounding and
contacting the engaging section of the holder,

wherein

the holder and the bracket define voids configured to permit connection of the holder
and the bracket at a plurality of relative dispositions,

the laser beams from the at least three light emitting points scan the recording medium in a main scanning direction while being at least one of on and off so as to form a light image having the minimum recording interval on the recording medium,

the equal interval is not greater than the minimum recording interval,

the at least three light emitting points are arranged such that the corresponding laser beam spots on the recording medium are arranged substantially in a line in a direction orthogonal to the main scanning direction, and

any one of the three or more laser beams is used as a clock laser beam configured to determine a timing of starting each main scanning.

7. (Canceled)

8. (Previously Presented) The image forming apparatus according to Claim 6, further comprising:

an abnormal lighting detector configured to detect abnormal lighting of one of the at least three light emitting points configured to emit the clock laser beam; and

a laser beam changer configured to change the clock laser beam to any one of the laser beams emitted by the other light emitting points normally emitting a laser beam, when the abnormal lighting detector detects abnormal lighting.

9. (Previously Presented) The image forming apparatus according to Claim 6, wherein a variation in position of the lower beam spots configured to be arranged substantially in a line is not greater than $21.17\ \mu\text{m}$.

10. (Previously Presented) The image forming apparatus according to Claim 6, wherein the equal interval is not greater than $14\ \mu\text{m}$.

11. (Currently Amended) A multi-beam scanning device comprising:

a subassembly comprising

a holder comprising a mounting portion, an engaging section, and a projection,

a laser emitting means for emitting laser beams [[,] disposed on the mounting portion of the holder and comprising at least three light emitting points arranged in a package at an equal interval and configured to emit the at least three laser beams to form corresponding laser beam spots on a recording medium at a minimum recording interval, the laser emitting means disposed on a means for holding having a projection configured to receive a means for collimating the laser beams thereon,

a collimator lens disposed on the projection, and

an aperture disposed on the projection to cover the collimator, and

a bracket defining an engaging hole, the engaging hole of the bracket surrounding and contacting the engaging section of the holder,

wherein

the holder and the bracket define voids configured to permit connection of the holder and the bracket at a plurality of relative dispositions,

the laser beams from the at least three light emitting points scan the recording medium in a main scanning direction while being at least one of on and off so as to form a light image having the minimum recording interval on the recording medium,

the equal interval is not greater than the minimum recording interval,

the at least three light emitting points are arranged such that the corresponding laser beam spots on the recording medium are arranged substantially in a line in a direction orthogonal to the main scanning direction, and

any one of the laser beams is used as a clock laser beam configured to determine a timing of starting each main scanning.

12. (Canceled)

13. (Previously Presented) The multi-beam scanning device according to Claim 11, further comprising:

an abnormal lighting detection means for detecting abnormal lighting of one of the at least three light emitting points configured to emit the clock laser beam; and

a laser beam changing means for changing the clock laser beam to any one of the laser beams emitted by the other three light emitting points normally emitting a laser beam, when the abnormal lighting detection means detects abnormal lighting.

14. (Original) The multi-beam scanning device according to Claim 11, wherein a variation in position of the laser beam spots arranged substantially in a line is not greater than 21.17 μm .

15. (Original) The multi-beam scanning device according to Claim 11, wherein the equal interval is not greater than 14 μm .

16. (Currently Amended) An image forming apparatus comprising:

means for recording data thereon; ~~and,~~

a subassembly comprising

a holder comprising a mounting portion, an engaging section, and a projection,

means for emitting laser beams [[,] disposed on the mounting portion of the holder and comprising at least three light emitting points arranged in a package at an equal interval and for emitting laser beams to form corresponding laser beam spots on the means

for recording at a minimum recording interval, ~~the means for emitting laser beams disposed on a means for holding having a projection configured to receive a means for collimating the laser beams thereon,~~

a collimator lens disposed on the projection, and

an aperture disposed on the projection to cover the collimator, and

a bracket defining an engaging hole, the engaging hole of the bracket surrounding and contacting the engaging section of the holder,

wherein

the holder and the bracket define voids configured to permit connection of the holder and the bracket at a plurality of relative dispositions,

the laser beams scan the means for recording in a main scanning direction while being at least one of on and off so as to form a light image having the minimum recording interval on the means for recording,

the equal interval is not greater than the minimum recording interval,

the at least three light emitting points are arranged such that the corresponding laser beam spots on the means for recording are arranged substantially in a line in a direction orthogonal to the main scanning direction, and

any one of the laser beams from the at least three light emitting points is used as a clock laser beam for determining a time to start each main scanning.

17. (Canceled)

18. (Previously Presented) The image forming apparatus according to Claim 16, further comprising:

means for detecting abnormal lighting of the one of the at least three light emitting points that is used to emit the clock laser beam; and

means for changing the clock laser beam to any one of the laser beams emitted by the other three light emitting points, when the means for detecting abnormal lighting detects an abnormal lighting condition.

19. (Original) The image forming apparatus according to Claim 16, wherein a variation in position of the at least three laser beam spots arranged substantially in a line is not greater than $21.17\mu\text{m}$.

20. (Original) The image forming apparatus according to Claim 16, wherein the equal interval is not greater than $14\mu\text{m}$.

21. (Currently Amended) A multi-beam scanning device comprising:

a subassembly comprising

a holder comprising a mounting portion, an engaging section, and a projection,

a light beam emitting array disposed on the mounting portion of the holder and
comprising three or more light emitting elements, which are arranged at predetermined locations and which emit respective laser beams to form corresponding laser beam spots on a recording medium at a minimum recording interval, ~~the light beam emitting array disposed on a holder having a projection configured to receive a collimator thereon,~~

a collimator lens disposed on the projection, and

an aperture disposed on the projection to cover the collimator, and

a bracket defining an engaging hole, the engaging hole of the bracket surrounding and
contacting the engaging section of the holder,

wherein

the holder and the bracket define voids configured to permit connection of the holder
and the bracket at a plurality of relative dispositions,

the three or more laser beams scan the recording medium in a main scanning direction while being put on or off to form a light image having the minimum recording interval on the recording medium,

the three or more light emitting elements are arranged such that the corresponding laser beam spots on the recording medium are arranged substantially in a line in a direction orthogonal to the main scanning direction,

the predetermined locations of the three or more light emitting elements are such that the elements are arranged at an equal interval and the equal interval is not greater than the minimum recording interval, and

any one of the laser beams from the at least three light emitting points is used as a clock laser beam for determining a time to start each main scanning.

22. (Previously Presented) The multi-beam scanning device according to Claim 21, wherein the equal interval is P_i and P_i is set to fulfill the following equation:

$$P_i = (f_{co}/f_{cy}) \cdot (P_i'/\beta_s),$$

wherein f_{co} is the focal length of a light collecting element, which collects the light emitted from the light beam emitting array,

f_{cy} is the focal length of a light beam shaping element, said light beam shaping element shaping the light beam passing through the light collecting element before the light beam is reflected by a light beam deflecting element, said light beam deflecting element deflects the light beams for scanning the recording medium,

wherein β_s is the lateral direction magnification in the sub-scanning direction, and

wherein P_i' is the minimum recording interval.

23. (Original) The multi-beam scanning device according to Claim 21, wherein a light collecting element is at least approximately arranged such that the optical axis of the

light collecting element passes at least approximately through the symmetrical center of the arranged of the light emitting elements.

24. (Canceled)

25. (Original) The multi-beam scanning device according to Claim 21, wherein the light beam emitting array is constituted such that the predetermined locations of the light emitting elements are set such that the centers of the light beam spots on the recording medium deviate less than $\frac{1}{2}$ from a target distance between centers of the light beam spots and a line in the main scanning direction, said line being defined such that the sum of the distances of the centers of the light beam spots is minimal.

26. (Previously Presented) The multi-beam scanning device according to Claim 21, further comprising:

an abnormal lighting detector configured to detect abnormal lighting of one of the three or more light emitting elements emitting a clock laser beam; and

a light beam changer configured to change the clock light beam to any one of the other laser beams emitted by the other light emitting elements normally emitting a light beam, when the abnormal lighting detector detects abnormal lighting,

wherein the abnormal lighting of the one of the three or more light emitting elements represents a deviation of at least one operating characteristic of the one light emitting element from the corresponding at least one target characteristic or represents leaving a target range of target characteristics.

27. (Currently Amended) A multi-beam scanning device, comprising:

a subassembly comprising

a holder comprising a mounting portion, an engaging section, and a projection,

a laser diode array disposed on the mounting portion of the holder and having

at least three light emitting points arranged at an equal interval and configured to emit

respective laser beams that form corresponding laser beam spots on a recording medium at a minimum recording interval, ~~the laser diode array disposed on a holder having a projection configured to receive a collimator thereon,~~

a collimator lens disposed on the projection, and

an aperture disposed on the projection to cover the collimator, and

a bracket defining an engaging hole, the engaging hole of the bracket surrounding and contacting the engaging section of the holder,

wherein

the holder and the bracket define voids configured to permit connection of the holder and the bracket at a plurality of relative dispositions,

the at least three laser beams from the at least three light emitting points scan the recording medium in a main scanning direction to form a light image having the minimum recording interval in the recording medium,

the equal interval is not greater than the minimum recording interval, and

one of the at least three laser beams is configured to be used as a clock laser beam to determine a starting time for each scanning.

28. (Currently Amended) An image forming apparatus comprising:

a recording medium; ~~and~~

a subassembly comprising

a holder comprising a mounting portion, an engaging section, and a projection,

a laser diode array disposed on the mounting portion of the holder and having

at least three light emitting points arranged at an equal interval and configured to emit respective laser beams that form corresponding laser beam spots on the recording medium at a minimum recording interval, ~~the laser diode array disposed on a holder having a projection configured to receive a collimator thereon,~~

a collimator lens disposed on the projection, and
an aperture disposed on the projection to cover the collimator, and
a bracket defining an engaging hole, the engaging hole of the bracket surrounding and
contacting the engaging section of the holder,

wherein

the holder and the bracket define voids configured to permit connection of the holder
and the bracket at a plurality of relative dispositions,

the at least three laser beams from the at least three light emitting points scan the recording medium in a main scanning direction to form a light image having the minimum recording interval on the recording medium,

the equal interval is not greater than the minimum recording interval, and

one of the at least three laser beams is configured to be used as a clock laser beam to determine a starting time for each scanning.

29. (Currently Amended) A multi-beam scanning device comprising:

a subassembly comprising

a holder comprising a mounting portion, an engaging section, and a projection,

a laser emitting means for emitting laser beams [[,]] disposed on the mounting
portion of the holder and comprising at least three light emitting points arranged at an equal
interval and configured to emit the at least three laser beams to form corresponding laser
beam spots on a recording medium at a minimum recording interval, the laser emitting means
disposed on a means for holding having a projection configured to receive a means for
collimating the laser beams thereon,

a collimator lens disposed on the projection, and

an aperture disposed on the projection to cover the collimator, and

a bracket defining an engaging hole, the engaging hole of the bracket surrounding and contacting the engaging section of the holder,

wherein

the holder and the bracket define voids configured to permit connection of the holder and the bracket at a plurality of relative dispositions,

the at least three laser beams from the at least three light emitting points scan the recording medium in a main scanning direction to form a light image having the minimum recording interval on the recording medium,

the equal interval is not greater than the minimum recording interval, and

one of the at least three laser beams is configured to be used as a clock laser beam to determine a starting time for each scanning.

30. (Currently Amended) An image forming apparatus comprising:

means for recording data thereon; and

a subassembly comprising

a holder comprising a mounting portion, an engaging section, and a projection,

means for emitting laser beams [[,] disposed on the mounting portion of the holder and comprising at least three light emitting points arranged at an equal interval and for emitting laser beams to form corresponding laser beam spots on the means for recording at a minimum recording interval,~~the means for emitting laser beams disposed on a means for holding having a projection configured to receive a means for collimating the laser beams thereon,~~

a collimator lens disposed on the projection, and

an aperture disposed on the projection to cover the collimator, and

a bracket defining an engaging hole, the engaging hole of the bracket surrounding and contacting the engaging section of the holder,

wherein

the holder and the bracket define voids configured to permit connection of the holder and the bracket at a plurality of relative dispositions,

the at least three laser beams scan the means for recording in a main scanning direction to form a light image having the minimum recording interval on the means for recording,

the equal interval is not greater than the minimum recording interval, and

one of the at least three laser beams is configured to be used as a clock laser beam to determine a starting time for each scanning.

31. (Canceled)